

AIDS Education in Tanzania: Promoting Risk Reduction among Primary School Children

ABSTRACT

Objectives. The purpose of this study was to test the effects of an education program in Tanzania designed to reduce children's risk of human immunodeficiency virus (HIV) infection and to improve their tolerance of and care for people with acquired immunodeficiency syndrome (AIDS).

Methods. A randomized controlled community trial including baseline and 12-month follow-up surveys was employed. Public primary schools in the Arusha and Kilimanjaro regions of Tanzania were stratified according to location and randomly assigned to intervention ($n = 6$) or comparison ($n = 12$) conditions. Of the 1063 sixth-grade students (average age: 13.6 years) who participated at baseline, 814 participated in the follow-up survey.

Results. At follow-up, statistically significant effects favoring the intervention group were observed for exposure to AIDS information and communication, AIDS knowledge, attitudes toward people with AIDS, and subjective norms and behavioral intentions toward having sexual intercourse. A consistent positive but nonsignificant trend was seen for attitudes toward having sexual intercourse and for initiation of sexual intercourse during the previous year (7% vs 17%).

Conclusions. It is feasible and effective to train local teachers and health workers to provide HIV/AIDS education to Tanzanian primary school children. (*Am J Public Health.* 1997;87:1931-1936)

Knut-Inge Klepp, PhD, MPH, Sidney S. Ndeki, MB, CHB, MSc, Melkizedeck T. Leshabari, PhD, Peter J. Hannan, PhD, and Babuel A. Lyimo, DEHS

Introduction

Human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) constitute a severe threat to the future health and well-being of children and adolescents in Tanzania. By the end of 1994, the Tanzanian health authorities had recorded 53 247 AIDS cases, but they estimated the actual number to be between 210 000 and 320 000 cases.¹ The total population in Tanzania is estimated to approach 28 million. Population-based surveys from various parts of the country have shown that HIV prevalence rates among adolescents and young adults (15 through 24 years old) range from 1% in rural areas to 21% in certain urban areas.²⁻⁵

A number of recent studies have indicated that school-based HIV/AIDS prevention and sex education programs may successfully increase students' knowledge about AIDS, change attitudes toward risk behaviors, delay onset of sexual intercourse, and increase condom use among sexually active students.⁶⁻⁹ Programs with a theoretical grounding in social learning or social theories appear to have been the most successful in changing risk behaviors, although the changes obtained have usually been modest.^{7,8} The majority of these studies have been conducted among older adolescents (middle or high school students) in Western, industrialized countries, and most of the HIV/AIDS prevention studies have had serious methodological problems.⁹ Results have been reported from at least three school-based HIV/AIDS education studies implemented in developing countries.¹⁰⁻¹² These studies, also conducted among secondary or high school students, all reported positive effects with respect to AIDS-related knowledge and attitudes toward people with AIDS and some posi-

tive effects regarding behavioral intentions. Data on behavioral outcome measures were not reported.¹⁰⁻¹²

In Tanzania, the majority of children enroll in primary school, while less than 15% continue on to secondary school.¹³ Recent studies have found that a substantial proportion of students in primary school grades 5 through 7 report being sexually active.¹⁴⁻¹⁶ Thus, children in primary school clearly constitute an important target group for AIDS prevention efforts in Tanzania. According to the national policy on HIV infection and AIDS in the early 1990s, education on reproductive health matters related to these and other sexually transmitted diseases should be integrated into school curriculums, but information on the use of condoms was to be distributed only in secondary schools. As the HIV/AIDS epidemic has evolved in Tanzania, this policy has been changed. The current policy states that school-based education related to HIV infection, AIDS, and other sexually transmitted diseases should include information

Knut-Inge Klepp is with the Institute for Nutrition Research, University of Oslo, Oslo, Norway. At the time of the study, he was with the Center for International Health, University of Bergen, Bergen, Norway. Sidney S. Ndeki is with the Centre for Educational Development in Health, Arusha, Tanzania. Melkizedeck T. Leshabari is with the Institute of Public Health, Muhimbili University College of Health Sciences, Dar es Salaam, Tanzania. Peter J. Hannan is with the Division of Epidemiology, University of Minnesota, Minneapolis. At the time of the study, Babuel A. Lyimo worked with the Tanzanian-Norwegian AIDS Project.

Requests for reprints should be sent to Knut-Inge Klepp, PhD, MPH, Institute for Nutrition Research, Faculty of Medicine, University of Oslo, PO Box 1046, Blindern, N-0316 Oslo, Norway.

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on condom use, although "condoms shall not be distributed to schools, for the reason that such decision connotes encouragement of sexual practices in schools."¹⁷

In 1992, an HIV/AIDS prevention program was implemented with sixth- and seventh-grade students in the Kilimanjaro and Arusha regions. Short-term evaluation results showed that the program had a positive impact on participating students' knowledge about AIDS, attitudes toward people with AIDS, and subjective norms and behavioral intentions toward being sexually active.¹⁸

Twelve months after the baseline survey, a follow-up survey was conducted. At this time the seventh graders initially surveyed had graduated from primary school and could not be reached. Thus, this survey included only the younger students (those who were sixth graders in 1992 and seventh graders in 1993). In this paper we present the results of this 12-month follow-up evaluation study.

Methods

Study Design and Participants

A randomized controlled community trial was used to evaluate the impact of this HIV/AIDS prevention program. The study was conducted in the Arusha and Kilimanjaro regions, two neighboring areas located in the northeastern part of Tanzania. All public primary schools in the two regions were stratified according to location as urban, semiurban, or rural schools, and three schools from each stratum within each region were randomly selected to participate. Of these 18 schools, 1 school within each stratum in each region was randomly assigned to the intervention condition, while the remaining 12 schools served as a delayed-intervention comparison group. All sixth-grade students at the 18 selected schools were invited to participate in the baseline survey (March 1992) and in the 12-month follow-up survey. A total of 1063 pupils (average age 13.6 ± 1.3 years) participated at baseline, representing approximately 85% of the eligible population. Nonparticipants were those pupils absent from school on the day of the survey. A total of 1074 seventh graders took part in the 12-month follow-up survey; of these, 814 (77%) had participated at baseline. The results of the intervention as reported in this paper are based on these 814 students; their sociodemographic characteristics are presented in Table 1.

TABLE 1—Sociodemographic Characteristics of Study Participants (n = 814)

	Comparison Group (n = 556)	Intervention Group (n = 258)
Sex, %		
Male	47.5	46.5
Female	52.5	53.5
Mean age, y \pm SD	13.6 ± 1.3	13.5 ± 1.2
School location, %		
Rural	17.4	19.4
Semiurban	20.9	24.0
Urban	61.7	56.6
Religion, %		
Catholic	33.9	34.5
Protestant	27.2	31.0
Muslim	24.5	24.8
Other	14.4	9.7

Trained Tanzanian project staff administered the surveys, which were conducted in the classrooms with no teachers present. Prior to handing out the questionnaires, project staff explained that all answers would be kept strictly confidential. Most students completed the questionnaire in 40 to 50 minutes. Students absent from school on the day of the survey were not recontacted. None of the students present at the time of the survey refused to participate at either baseline or follow-up.

Ngao: A Local HIV/AIDS Education Program

The program is called *Ngao*, the Swahili word for "shield," to symbolize that young people can learn to protect themselves from the AIDS virus. It was developed by local health educators in collaboration with the investigators. Students in the two regions represent a number of different ethnic and cultural groups, each with its own language. In addition, there are large urban-rural differences throughout the regions. Therefore, the educational material was designed to allow teachers to modify the contents according to the specific norms and values of each local community. A theoretical framework guided by the Theory of Reasoned Action¹⁹ and by social learning theory²⁰ was employed in designing the program. The overall goals of the program were to reduce students' risk of HIV infection by delaying initiation of sexual intercourse and to alleviate the consequences of HIV infection and AIDS in the community by reducing the stigma attached to AIDS. The specific objectives of the program were to

- encourage increased openness and

communication about AIDS, both in and out of school;

- provide students with thorough information about ways to protect themselves against AIDS;

- focus on the fact that it is safe to spend time with and care for people with the AIDS virus;

- foster restrictive attitudes and subjective norms toward early sexual activity; and

- reduce students' intentions to be sexually active in the near future, as well as their actual sexual involvement.

A teacher's manual and a student's booklet were written in Swahili, the official language used in primary schools. Two teachers and one local health worker were invited from each of the six intervention schools to attend a 1-week training workshop. After the workshop, the program was implemented over the course of a 2- to 3-month period, averaging about 20 school hours of class. The health workers often participated directly in the classroom training or served as resource people for the teachers. Because audiovisual equipment was not readily available throughout the regions (most schools lack electricity), classroom activities that could be implemented with a minimum of resources were emphasized.

Specific program activities were as follows: (1) Teachers provided factual information about HIV transmission and AIDS. (2) Students created their own posters depicting their perceptions of HIV risk factors. (3) Students wrote and performed songs and poetry about the danger of AIDS and how children their own age can protect themselves. (4) Students working in small groups discussed how people are exposed to HIV risk and what they themselves could do to reduce such risk. (5) Students wrote

and performed role-plays in which they argued publicly, trying to convince each other about aspects of HIV risk behaviors or practicing refusal skills relating to sexual involvement. (6) Students created and performed elaborate plays in which they wore their traditional clothes instead of school uniforms. These plays portrayed how AIDS was perceived and could be dealt with in the community. (7) Students performed the plays, role-plays, poetry, and songs outdoors in front of younger schoolmates. In this way, the program also had the potential to educate younger children.

Other activities were designed to increase communication with parents and other community members on AIDS issues. These activities included interviews with parents, other family members, and friends, as well as panel discussions at school at which community elders, religious leaders, and parents were invited to discuss how the community could take action against AIDS. Finally, each student received a T-shirt with the Ngao symbol. The T-shirts increased the visibility of the program in the communities and helped foster increased communication regarding AIDS. A more detailed description of this program and results from a process evaluation study have been presented elsewhere.²¹ A revised version of the Ngao program was provided to the comparison schools in 1994.

Measurements

The questionnaire was initially adapted from the World Health Organization's knowledge, attitudes, beliefs, and practices survey instrument for adolescents.²² Local health educators evaluated the appropriateness of selected items and translated the questionnaire from English to Swahili. The translated version was then submitted for peer review (by local schoolteachers and

research colleagues at Muhimbili University in Dar es Salaam) for content validity. After a pilot study conducted in 1991,¹⁵ the questionnaire was revised and expanded before being used in the study presented here.

Students provided demographic information including sex, age, grade level, and school. Exposure to AIDS information was assessed by asking students how often they had heard about AIDS from six different sources during the past month; (response categories ranged from 1 [never] to 4 [more than four times]). Communication regarding AIDS was similarly assessed by asking students how often during the past month they had talked about AIDS with people in their immediate social network, with health workers, or with religious leaders (same response categories as above). Summative scales were constructed for exposure to AIDS information and AIDS communication, and a high score indicated frequent exposure to AIDS information or communication. AIDS knowledge was assessed by asking students to respond to 18 statements regarding HIV transmission routes and AIDS with "correct," "incorrect," or "do not know." These items were recoded to 0 (wrong answer or "do not know") vs 1 (correct answer) and combined to form a knowledge score.

The questionnaire included four Likert-scale items addressing attitudes toward people with AIDS (e.g., "I would visit a friend I knew had the AIDS virus"). Eight items addressed students' beliefs about the consequences of having sexual intercourse within the next 3 months, and eight corresponding evaluations of these consequences were included to assess attitudes toward having sexual intercourse (e.g., "It is easier to be accepted by your friends if you have sexual intercourse" [behavioral belief]; "It is important for me to be accepted by my friends" [outcome evaluation]). Seven

Likert-scale items addressing beliefs about the opinions of others and corresponding items addressing motivation to comply with these opinions were included to assess subjective norms regarding sexual intercourse (e.g., "Most of my friends think I should have sexual intercourse" [normative belief]; "It is important for me to do the things my friends want me to do" [motivation to comply]). The specific wording of the various items has been published elsewhere.^{16,23}

Response categories for all these Likert-scale items ranged from 1 (strongly disagree) to 5 (strongly agree), and items for the different theoretical constructs were combined to form summative scores. A high score on the attitude toward people with AIDS scale indicated positive attitudes toward people with AIDS, while a high score on attitude or subjective norms regarding sexual intercourse indicated restrictive attitudes or norms toward being sexually active. Behavioral intention to engage in sexual intercourse over the next 3 months was measured by one item: "Do you think you will have sexual intercourse within the next 3 months?" (yes or no). Finally, students were asked if they had ever had sex (yes or no).

Students with missing values on a third or fewer of the items constituting any scale were assigned the mean value for the missing item(s). Students with missing values on more than one third of the items on any scale were assigned a missing value for the scale. The number of items, range of scores, Cronbach's α values, and students' mean scores, by gender, for the scales at baseline are presented in Table 2.

Data Analysis

These data constitute a repeated measures design with two measures per subject (baseline and follow-up). However, analysis

TABLE 2—Description of Scales and Students' Mean Scores at Baseline: AIDS Education Program, Tanzanian Primary Schools, 1992

	No. Items	Range of Scores	No. Respondents	Cronbach's α	Mean Score \pm SD			P^a
					Boys	Girls	Total Sample	
AIDS information	6	1–19	758	.73	9.7 \pm 4.2	8.7 \pm 4.3	9.2	.002
AIDS communication	5	1–16	760	.75	7.2 \pm 3.8	6.7 \pm 4.0	6.9	.13
AIDS knowledge	18	0–18	806	.72	11.7 \pm 3.2	11.0 \pm 3.3	11.3	.001
Attitudes toward people with AIDS	4	1–17	786	.52	7.5 \pm 3.9	6.1 \pm 3.5	6.7	.0001
Attitudes toward engaging in sexual intercourse	16	1–65	796	.78	38.4 \pm 11.3	43.4 \pm 10.2	41.1	.0001
Subjective norms regarding sexual intercourse	14	1–57	801	.66	41.4 \pm 8.3	41.7 \pm 8.2	41.5	.59

^a P values for gender differences at baseline.

of covariance (adjusting for the baseline measure) is more powerful than a repeated measures analysis if the correlation is less than 0.5. As this was the case for all the variables analyzed here, we used analysis of covariance of the follow-up variable, adjusting for the baseline value as well as for gender. The urban/rural trichotomy variable (UR) and the Kilimanjaro/Arusha variable (Region) define six strata, each with one intervention and two control schools. The analysis was blocked on the six strata, that is, main effects and interactions of UR and Region were included in the model, but no interactions of UR or Region with other variables were included. Because specific schools occur in only one or another treatment group, the schools contribute a source of variability (beyond individual variability) against which the treatment effect must be assessed. Thus, treatment effects are judged on a *t* statistic having 11 degrees of freedom. This is conveniently done by the use of proc MIXED (Version 6.09, 1993; SAS Institute Inc, Cary, NC), which allows schools to be treated as a random effect in a mixed-model analysis of variance. We generated adjusted means at follow-up to determine the direction of the intervention effect.

The variables for behavioral intentions and beginning of sexual activity were skewed, with heavy modes at zero. Hence these variables were dichotomized for analysis.

We also investigated the initiation of sexual activity in this population. We excluded those who said at baseline that they had engaged in sexual activity. The analysis of initiation of sexual activity was adjusted for age and gender because these variables are strong predictors for the initiation of sexual activity.

Results

As can be seen in Table 1, there were no significant differences between students from intervention schools and comparison schools on any of the sociodemographic characteristics.

A total of 249 students who participated at baseline (23.4%) did not take part in the 12-month follow-up survey. We found that this attrition rate was higher in the comparison schools than in the intervention schools (25.1% vs 19.6%; $P = .05$), higher among children attending semiurban schools than among those attending rural schools (28.2% vs 12.5%; $P < .001$), and higher among Catholic students than among Protestant students (26.9% vs 16.7%; $P =$

.002). Furthermore, students who dropped out of the study had been found at baseline to have less exposure to AIDS information (8.4 vs 9.2; $P = 0.02$) and to hold subjective norms more favorable toward becoming sexually active (39.8 vs. 41.6; $P = .001$) than did the cohort participants. No other differences were observed with respect to demographic, cognitive, or behavioral variables, including reported sexual activity.

At baseline, participating boys reported having been exposed to AIDS information more frequently than did participating girls, and the boys also reported more favorable attitudes toward people with AIDS (Table 2). Furthermore, boys reported more often having been sexually active in the past than did girls (50.8% vs 10.4%; $P < .001$). Consistent with this pattern, they expressed more favorable attitudes toward engaging in sexual intercourse and stronger intentions to engage in sexual intercourse in the near future (39.4% vs 22.1%; $P < .001$).

There were no statistically significant differences between students from intervention schools and comparison schools on any of the HIV/AIDS-related outcome measures at baseline. Twelve months after the implementation of the Ngao HIV/AIDS educational program, students from the intervention schools reported being exposed to AIDS information and discussing HIV/AIDS significantly more frequently than did students from the comparison schools. Students exposed to the program demonstrated a significant increase in their AIDS-related knowledge level and reported significantly more positive attitudes toward people with AIDS than did pupils from the comparison schools (Table 3).

Furthermore, 12 months after the implementation of the program, significant program effects were seen for subjective norms and intentions with regard to engaging in sexual intercourse. Students attending the intervention schools also reported more restrictive attitudes toward engaging in sexual intercourse than did students from the comparison schools, but this finding was not statistically significant (Table 3). Finally, we found a nonsignificant trend indicating that fewer students from the intervention schools than from the comparison schools had had their sexual debut during the previous year (7% vs 17%). This trend was seen for both boys (14% vs 35%) and girls (3% vs 6%).

Discussion

In this paper we report on the first controlled, multiple-community test of an

HIV/AIDS prevention program targeting primary school children in a developing country with a high prevalence of AIDS and HIV infection. Furthermore, this is the first school-based HIV/AIDS study from a developing country to report long-term follow-up results (12 months), including behavioral outcomes, and to adjust for the school component of variance in the data analysis.

The results of this study clearly show that HIV/AIDS education targeting sixth graders can foster increased exposure to and communication of information about HIV infection and AIDS. The program seems to have succeeded in making AIDS a topic of discussion outside as well as within the school setting, as pupils reported discussing AIDS with their parents, other relatives, and religious leaders more frequently after the intervention. Thus, this school-based program may have contributed to an increase in the general community awareness of HIV infection and AIDS.

The results further demonstrate that the program led to a substantial increase in pupils' knowledge of AIDS and helped create more positive attitudes toward people with AIDS. As the number of AIDS cases in Tanzania is rapidly increasing,¹ the need for home-based care of AIDS patients is also increasing. By disseminating information about appropriate home-based care and the lack of risk associated with casual contact with HIV-infected people and with taking care of AIDS patients, this school-based program may have helped to reduce the levels of fear and stigma attached to HIV infection and AIDS throughout the communities.

The results also show that the Ngao program created more restrictive subjective norms and reduced students' intentions to be sexually active in the near future. Consistent with the above findings, we found that students exposed to the program reported stricter attitudes toward having sexual intercourse than did their peers attending the comparison schools. This finding failed, however, to reach the statistical significance level of .05, as did the difference in age at sexual debut reported by the two groups.

As already noted, the Arusha and Kilimanjaro regions constitute a culturally and ethnically complex area that also has large urban-rural differences relevant to sexual behavior and reproduction.¹⁶ After controlling for urban/rural and regional statuses, we still found a relatively large component of variance contributed by school differences, and we have used the school level of variability as the error term for testing the condition effect via a *t* statistic based on 11

TABLE 3—Changes in HIV/AIDS-Related Outcome Variables from Baseline to the 12-Month Follow-up Survey

	Intervention Schools	Comparison Schools	Net Effect	P ^a
AIDS information, mean score				
Baseline	9.3	9.2		
Follow-up	13.1	10.5	2.5	.005
AIDS communication, mean score				
Baseline	7.1	6.8		
Follow-up	10.7	8.2	2.2	.0008
AIDS knowledge, mean score				
Baseline	11.5	11.2		
Follow-up	13.8	11.1	2.4	.0004
Attitudes toward people with AIDS, mean score				
Baseline	6.4	6.9		
Follow-up	8.8	6.5	2.8	.0015
Attitudes toward engaging in sexual intercourse, mean score				
Baseline	40.7	41.5		
Follow-up	50.0	47.0	3.8	.27
Subjective norms regarding sexual intercourse, mean score				
Baseline	41.8	41.5		
Follow-up	45.6	43.4	1.9	.013
Behavioral intention to engage in sexual intercourse, %				
Baseline	28.3	31.1		
Follow-up	10.0	24.1	11.3	.006
Initiation of sexual activity between baseline and follow-up, %	6.6	16.5	9.9	.19

^aP values are calculated on baseline adjusted values; the *t* distribution with 11 *df* is used to incorporate the variation between schools.

degrees of freedom. This is the proper error term for a community trial such as this.

We have previously presented the immediate, short-term outcome results from this evaluation study.¹⁸ The results presented in this paper demonstrate that the consistent and positive results were maintained over time while the students remained in school. Our experience further indicates that it is feasible to train local teachers and health workers to implement a school-based program designed to reduce children's risk of HIV infection and to help alleviate the consequences of HIV infection in their communities. The Ngao program relied largely on traditional teaching methods and local human resources.

This study has several methodological limitations. First, a potential threat to validity is found in the observed attrition rate (23%) from baseline to follow-up. Subjects at high risk for engaging in health-compromising behaviors tend to be over-represented among nonparticipants. At baseline, we did not observe any differences in reported sexual behavior between participants and nonparticipants; however, non-participating students did report less exposure to AIDS information, and subjective norms more in favor of being sexually active, than did participants. Furthermore, attrition rates were higher among Catholics than among Protestants, higher among students attending semiurban schools than among those attending rural schools, and

somewhat higher among students attending comparison schools than among students at intervention schools. Students were not notified in advance that the survey would take place on a certain date, and none of the students present on the day of the survey refused to participate. Thus, we do not believe that this attrition was due to students' not wanting to participate in the study; rather, we believe that this attrition reflects the high proportion of school dropouts in the Tanzanian public school system¹³ and points to the need for supplementing school-based programs with prevention efforts targeting out-of-school youth. As the attrition rate was somewhat higher in the comparison schools than in the intervention schools, we do not believe that this potential bias represents a major threat to our main conclusion about the effect of this educational program.

Another concern regarding this study is the fact that risk behavior was defined only in terms of involvement in sexual intercourse. No other risk behaviors or preventive actions, including condom use, were assessed. At the time this study was being planned, the Ministry of Education and Culture was opposing condom promotion in primary schools, and we felt a need to restrict and focus the number of sensitive questions being asked of these young students. Because sexual intercourse is the main HIV transmission route in Tanzania, the initiation of sexual intercourse was seen

as an appropriate target behavior in this study. Also, at the time of the study, condoms were not seen as readily accessible to school students throughout the two regions. However, results from a population-based survey of adults in the Arusha and Kilimanjaro regions conducted in November 1992 indicated that 17% of older adolescents (15 through 19 years old) had used condoms at least once.²⁴ Furthermore, researchers evaluating an AIDS education and condom promotion pilot program targeting bar workers and truck drivers in Tanzania observed that while reported condom use significantly increased following the program, so did reported oral and anal sex.²⁵ Thus, we strongly recommend that future studies be designed to assess a broader repertoire of sexual behavior and to specifically address these behaviors, including condom use, in the educational program.

Teachers and local health workers at the comparison schools received training and program materials with which to implement a revised version of the Ngao program after the completion of this 12-month follow-up evaluation study. Because of the large distances and poor means of communication between schools, we believe that diffusion of the intervention does not constitute any threat to the validity of our findings.

Finally, although it demonstrates positive effects 12 months after the beginning of the Ngao program, this study fails to address the long-term impact of school-

based AIDS education after students leave school (the majority of students in Tanzania leave school after completing seventh grade). Thus, we recommend that future studies be designed to follow students after primary school graduation and, if possible, to include measures of sexually transmitted diseases (including HIV infection) and unwanted pregnancies. In addition, it is clear that programs targeting the large proportion of adolescents not in school need to be developed.

Overall, the results of this study indicate that it is feasible and effective to implement culturally specific HIV/AIDS education with children in primary school in Tanzania. After this evaluation study, participating teachers and health workers helped write a revised curriculum, which has since been implemented in comparison schools. Furthermore, in collaboration with the Ministry of Education and Culture, the Ngao program has been revised and pilot-tested for use in secondary schools throughout Tanzania. □

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